

NASA Pathways Internship Showcase

Summer 2013

By

Jonathan Davis

Organization: IT-D1 Voice and Imagery
Supervisor: Chuck Brown
Mentor: William Merrill

Graduating December 2013
University of South Florida
BS Electrical Engineering
Tampa, FL

What Voice and Imagery does

Voice

Operational Intercom System – MOVE (OIS-M)
Operational Intercom System – Quintron (OIS-Q)
Astronaut Communication (AstroComm)
Trunked Radio System (TRS)
Paging Area Warning System (PAWS)
Voice Recording



What Voice and Imagery does

Imagery

Photo Optical Control System (POCS)

Operational Television (OTV)

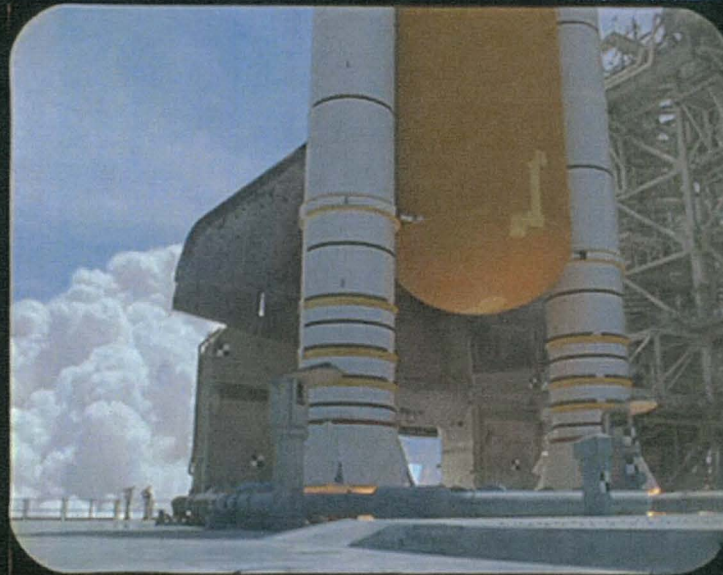
Public Affairs Office (PAO)

Broadband Communications Distribution System (BCDS)

Timing and Countdown (T&CD)

Electronic Security System (ESS)

Imaging Recording



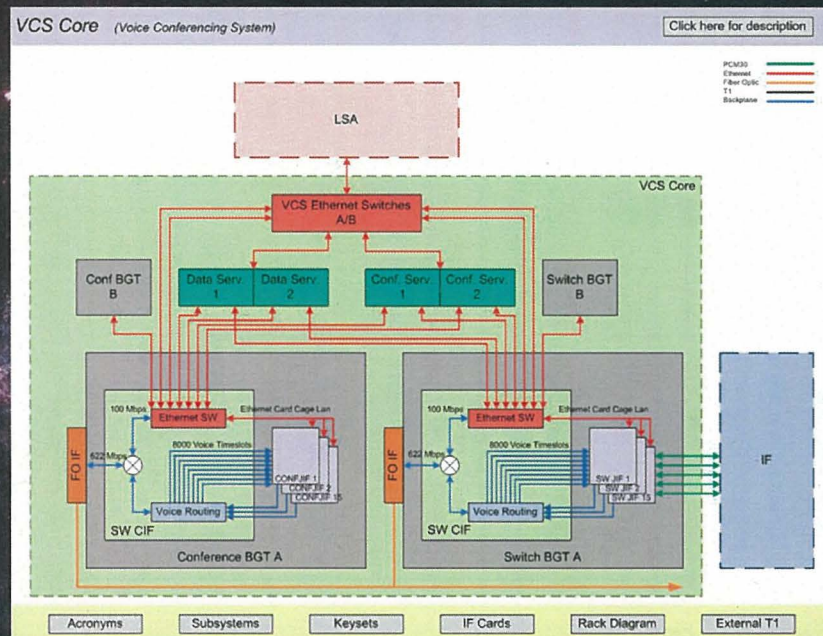
57
81
09
20
18

What I Did

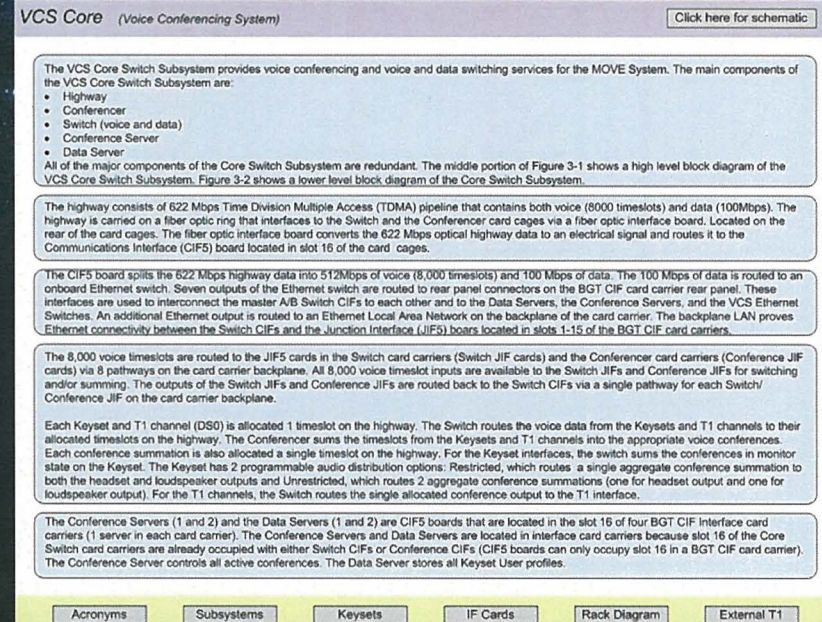
OIS-M Visio Project

Illustrative and interactive tool for finding information on the OIS-M system.

System flowchart and subsystem schematics



Descriptions of system operation



What I Did

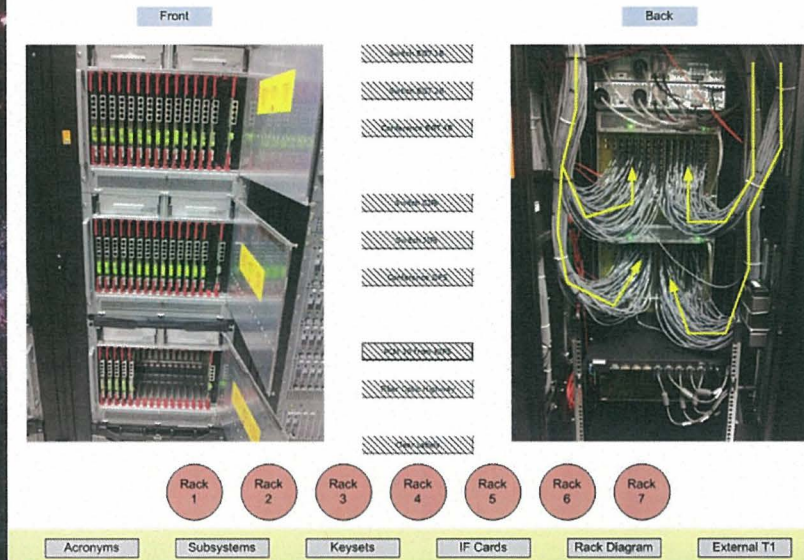
OIS-M Visio Project

Illustrative and interactive tool for finding information on the OIS-M system .

Photos of physical rack units at their operational location with interactive labeling

Info and photos of subsystem components

IA Rack 2 (Industrial Area - CD&SC Building Room 162)



Conference JIF (Junction Interface Card)

In this application the JIF5 builds the active conferences for the system by summing the appropriate audio timeslots input from the Keysets and T1 DS0s (each Keyset and T1 DS0 is allocated on of the 8000 available timeslots) and outputting the resultant summed audio onto the conference timeslot.

When used in this application, the JIFs will occupy slots 1 through 15 of the Conference BGT CIFs.



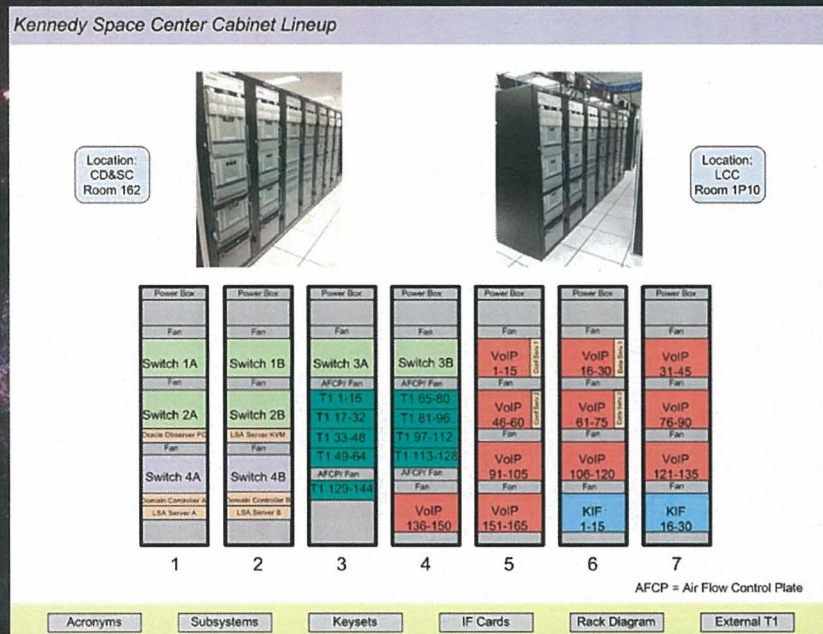
Acronyms Subsystems Keysets IF Cards Rack Diagram External T1

What I Did

OIS-M Visio Project

Illustrative and interactive tool for finding information on the OIS-M system.

OIS-M Rack Diagram



Other important information

External T1 Sources

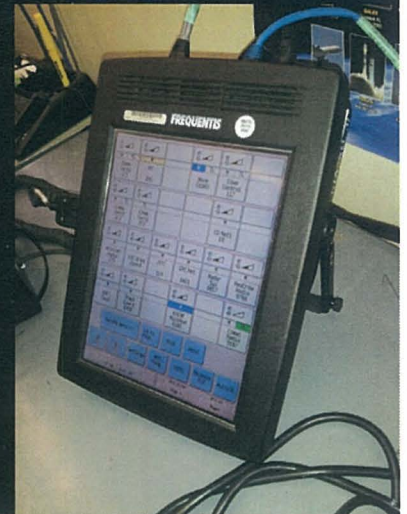
1. **NISN Interface:** This interface provides the capability to connect any single user or group of users at KSC to other mission sites remote to KSC (i.e. other NASA Centers). All voice conference interfaces to the NISN Interface via the T1/DS1 circuits.
2. **OIS-D:** Since OIS-D will coexist with OIS-M for an undetermined period of time, OIS-D will have an interface to OIS-M. This interface will allow OIS-M users to share communications conferences with OIS-D users until such time as OIS-D is completely decommissioned.
3. **AstroComm:** This interface is used to communicate with the launch vehicle crew and includes all vehicles interfaces including umbilical voice, telemetry voice, and any emergency RF voice interfaces.
4. **KSC Radios:** This interface provides connectivity to the KSC Radio system used throughout KSC. OIS-M will have conferences that will correspond to trunked radio talk groups allowing any users of the OIS-M who have access to these conferences to communicate with radios.
5. **KSC PAWS:** This interface provides connectivity to the KSC wide paging system. OIS-M will have paging conferences designated for various facilities at KSC. The KSC paging system will distribute OIS-M paging conference audio to paging speakers within the various facilities.
6. **Transport Services:** Transport services will be made up of T1s and Ethernet services for communications between the VCS3020 switches and to the remote keysets. These services will be provided by other NASA-C&I Subsystems.
7. **KSC VRS:** This interface provides the capability to record voice conferences as required. The recorder interface to the OIS-M voice switch is via multiple T1 interfaces. Each T1 can contain up to 24 conferences, at 64 kbps each. The conference to be recorded are assigned by the LSA and are TBD. OIS recorders are located in room 162 of the CD&SC. Each of the thirty six recorders is capable of recording one T1 link containing 24 T1 conferences. As the OIS-M equipment is installed and becomes operational those conferences will be assigned to recorders formerly recording OIS-D T1 conferences. The MOVE project provides voice recorders which KSC will use to serve the clients of OIS-M voice conferences.
8. **PABX:** The PABX is the telephone interface to the OIS-M system. Telephone numbers can be added to the keysets and can be accessed via a line key on the keysets.
9. **OIS-Q:** OIS-Q is a fully digital, multichannel, non-blocking conferencing communications system. It has been designed to allow the expandability necessary for Shuttle landing at KSC and Crawler Transporters 1 and 2 for the support of Shuttle operations to and from the launch pads. The system is designed to interface with the existing audio bridge distribution system, radio net interface and standard T1 format voice circuits.
10. **KVQMAS:** The Kennedy Voice Quality Monitor and Analysis System is a troubleshooting tool used for circuit monitoring of external voice conferences using Spectral Display for initial capture of audio. It can monitor multiple DS-0 conferences from OFF-CENTER T1s simultaneously for voice conference impairments.

Acronyms
Subsystems
Keysets
IF Cards
Rack Diagram
External T1

What I Did

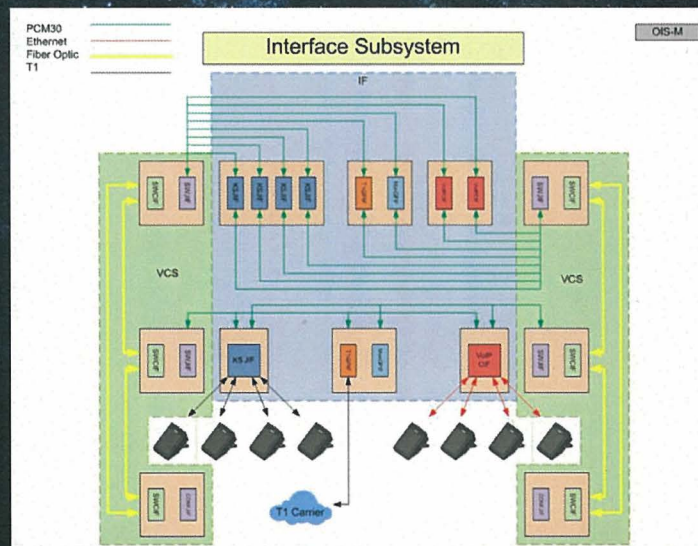
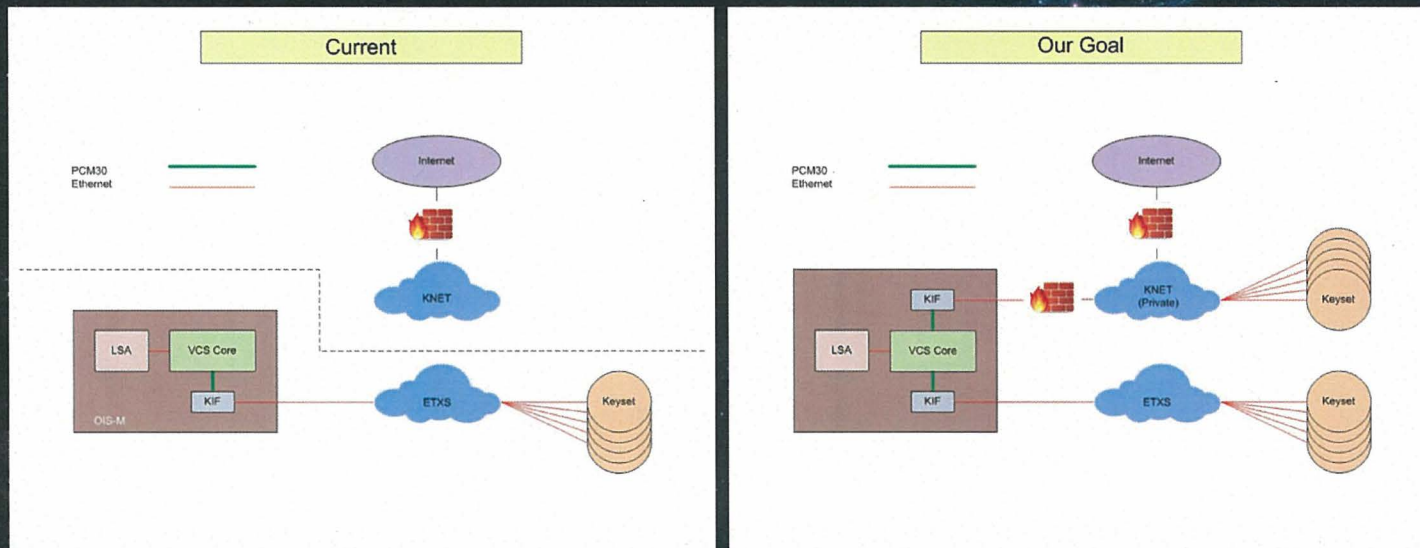
Keysets on KNET - Architectural Control Board

- Goal was to allow the connection of Keysets to OIS-M via KNET
- A cheaper alternative to the Ethernet Transmission System (ETXS)
- Allows for temporary or remote communication where ETXS is not currently installed
- Could potentially decrease the security of the system
- Concerns were brought up at the initial ACB about inadequate system drawings and the need for operational guidelines
- Tasked with creating architecture drawings to better illustrate the security of the system
- Presented my drawings at the second ACB
- Allowed to proceed with the approval process to put Keysets on KNET



What I Did

ACB Drawings





What I Did

Asterisk Training School

Asterisk is a free, open source framework for building communications applications. Asterisk powers IP PBX systems, VoIP gateways, conference servers and other custom solutions.

Created by Mark Spencer in 1999 while he was interning at Adtran.

Three day course on telephony, programming, and hardware setup using the Asterisk system.

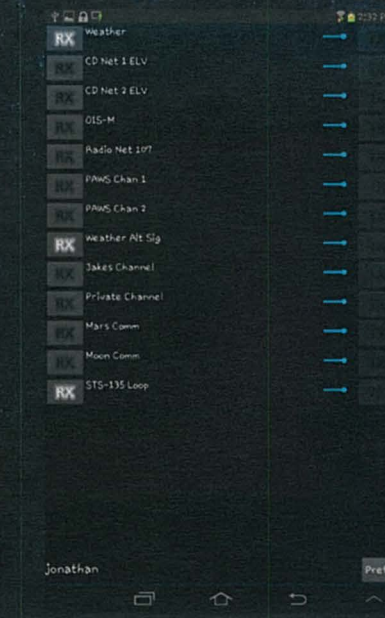


What I Did

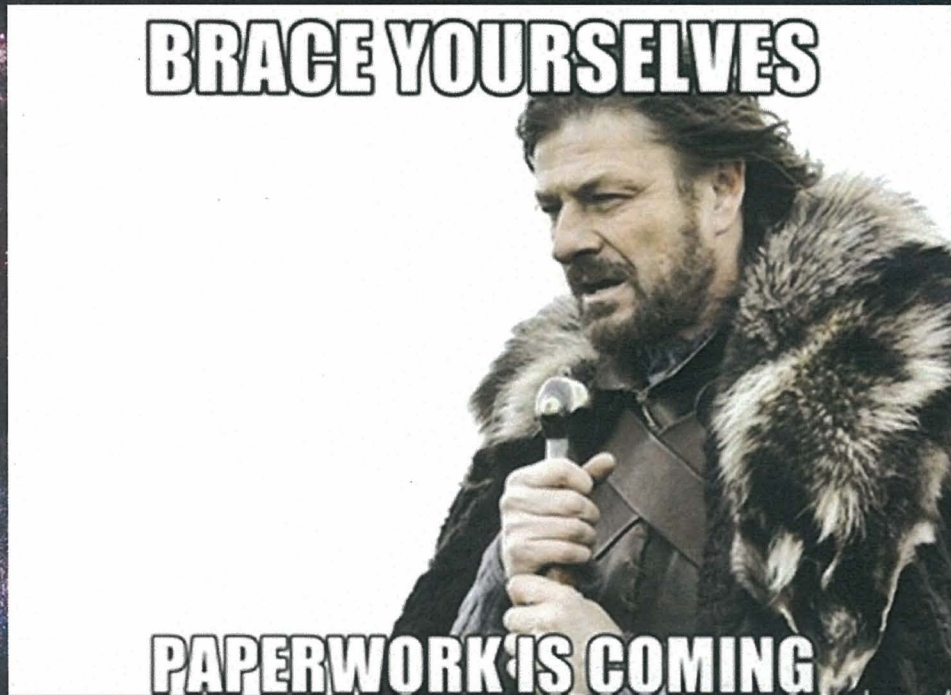
OIS-M Enhancements

Application being developed by Mark Spencer that allows the connectivity of mobile devices to OIS-M.

- Worked with design contractor (Avilution) to help test new app being developed on multiple devices connected to the OIS-M test bed.
- Tasked with development of a backup and restoration plan for new devices.
- Configured mobile devices for operational use.
- Wrote the test procedure for installing and using the app on devices.
- In the process of investigating advanced security options with recent mobile innovations.



What's next



- Update documentation to allow Keysets on KNET and to facilitate OIS-E
- Write new documentation for OIS-E
- Boards and meetings
- Research alternative solutions using Asterisk
- Photographic catalog of keyset locations
- Continued work on Visio project
- Similar projects in other IT divisions

Other Cool Stuff

- Spoke to high school students about college, the STEM field, and the Pathways program
- Coordinated the use of Pathways Interns in testing wireless headsets in the firing room
- Bowling with upper management
- Atlas V rocket launch for the MUOS mission



What I've learned

Technical

- Networking and telephony
- Linux OS
- Mobile applications, programming and device modification
- Supplemented communication systems principles
- Visio ninja

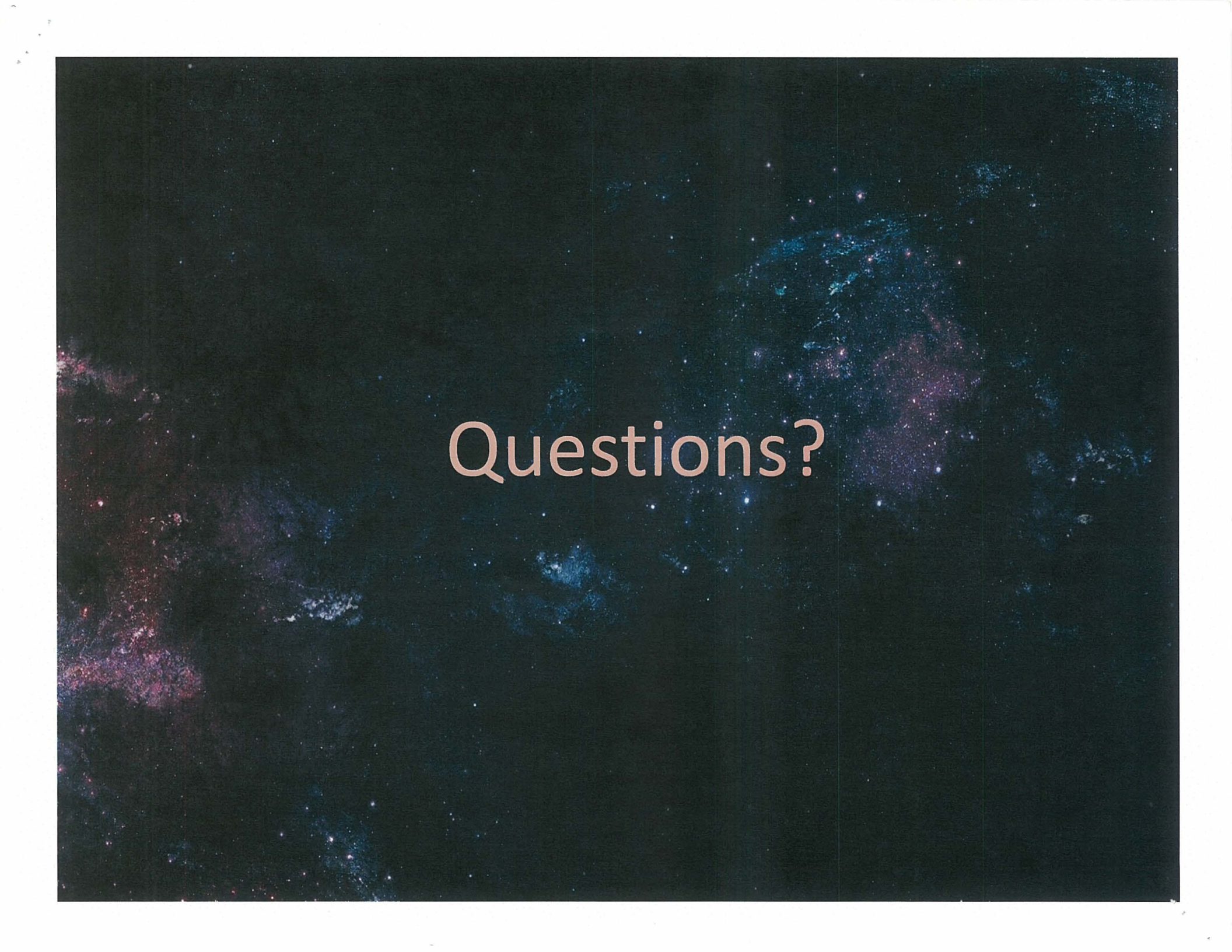
Administration and Business

- Process for implementing an idea
- What it's like to work with professional engineers
- Financial obligations and restrictions

Other

- NASA past history and future goals
- Increased presentation confidence and skills
- Business networking and team building

ACRONYMS!



Questions?